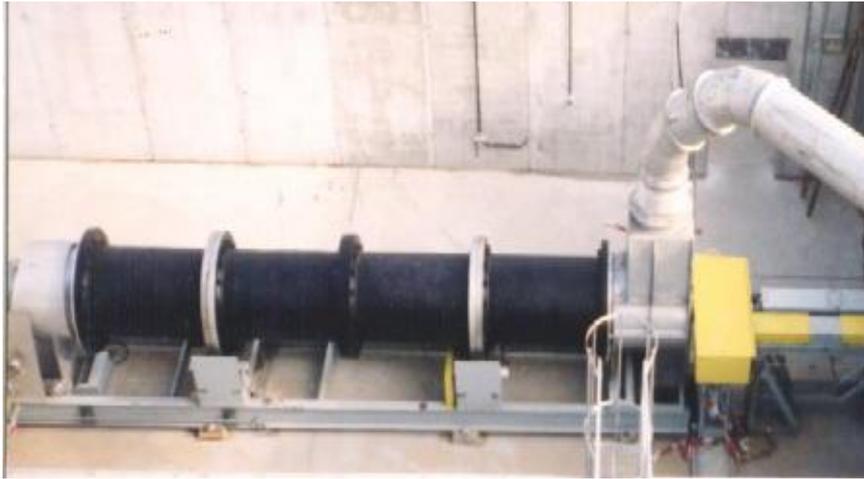


El Dorado Engineering, Inc.

Propellant Disposal Technology



Contact: Bob Hayes / 801-966-8288 / bhayes@eldoradoengineering.com

El Dorado Engineering, Inc.

Designers - Consultants

- EDE Specializes In:
 - Demilitarization of conventional munitions, chemical munitions, bulk Propellants, Explosives, and Pyrotechnics (PEP), and rocket motors
 - Recycling of munitions, explosive, and propellant wastes
 - Environmental consulting, permitting and restoration, related to PEP
 - Hazardous/explosive waste treatment and disposal
- Capabilities Include:
 - Design
 - Consulting
 - Fabrication
 - Installation
 - Commissioning
 - Training
 - Permitting
- Over 34 yrs. In the Demilitarization Business, HQ in Salt Lake City, UT
- Take pride in record of safety, project cooperation, and client satisfaction



El Dorado Engineering, Inc.

SAMPLE PROJECTS

- Design, install, & commission numerous turnkey Rotary Kiln Explosive Waste Incinerators including facilities in: Taiwan, U.K. Germany, Albania, Ukraine, Korea, Belgium.
- Design & provide numerous turnkey Transportable Flashing Furnace Systems (Used at: Ravenna AAP, Eglin AFB, Hill AFB, Anniston Army Depot, China Lake, Puerto Rico, Hawaii, Talon West Virginia, Letterkenny Army Depot.)
- Design/Build contained burn facilities for disposal of military & commercial energetic materials
- Design/build contained burn systems to dispose of nitrocellulose based propellant in small tactical rocket motors
- Design/Build turnkey facility for contained burn demilitarization of large AP based propellant tactical rocket motors for U.S. Army*
- Design & construct a facility to demilitarize flares, reclaiming and recycling magnesium
- Design, build, and test water jet washout system for chemical munitions
- Design munition preparation and disassembly equipment
- Design/Build turnkey induction heating meltout system for explosives recycling from mortars*
- Used our understanding of propellant combustion processes and atmospheric dispersion to consult for NASA on go/no-go launch criteria for Space Shuttle Launches, and permitting of test facilities.

Notes: * Ongoing



Demilitarization Technology Considerations

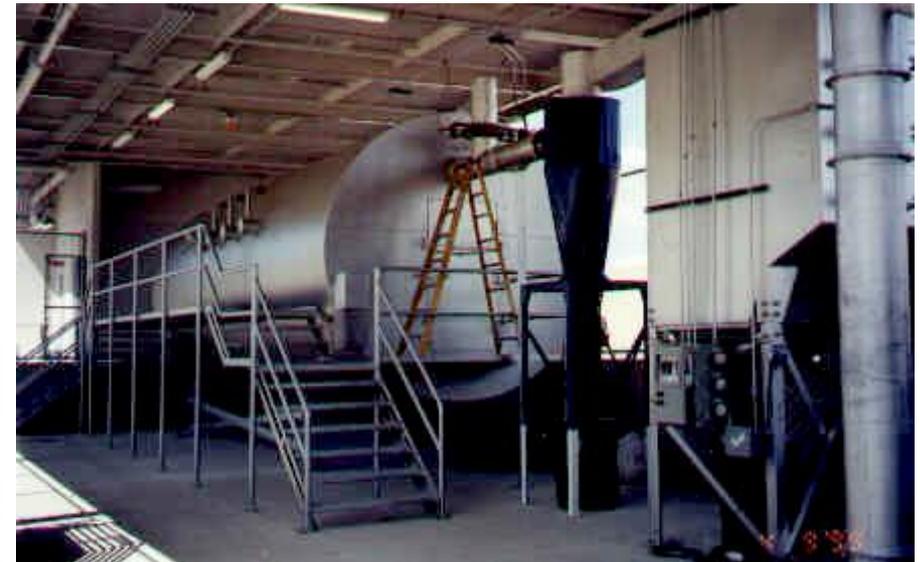
- Safe
- Environmentally Responsible
- Effective
- Robust
- Simple
- Proven
- Inexpensive
- Versatile

Non-Open Burning Thermal Treatment Alternatives

- **Contained Burn**
- **Rotary Kiln**
- Static Kiln
- “Tunnel” Furnace
- Co-firing
- Contained Detonation
- Car-bottom Furnace
- Transportable Furnaces

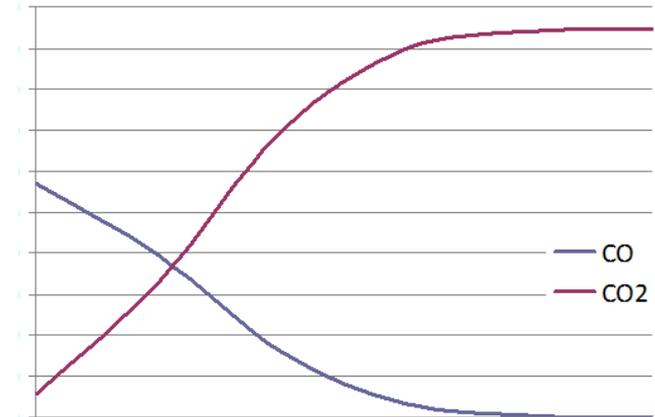
Contained Burn Systems

- Bulk Propellant, Explosives
- Tactical Rocket Motors
- Air Bag Propellants
- Igniters, Detonators
- PEP Contaminated Waste

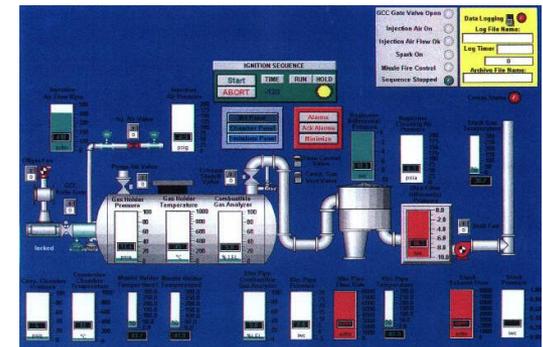


Contained Burn Technology System Elements

- Feed System:
 - Minimize Handling
 - Batch or Semi-Continuous
- Containment Vessel:
 - Promote Proper Combustion
 - Contain Products
- Ignition Source: Reliable, Safe
- Pollution Abatement System
 - Meter and Scrub Exhaust
 - Prevent Fugitive Emissions
- Controls



AIR TO FUEL RATIO



Contained Burn Technology Scaling



10 pounds per burn cycle

50,000 pounds per burn cycle



DOD Project Nitrocellulose Based Propellant



**Nitrocellulose Based Propellant Contained Burn System
Chamber and Pollution Abatement System**

Commercial Clients Various Turnkey Systems



DOD Tactical Rocket Motor Propellant Disposal

- Large Workload
 - 60 – 1605 lbs Propellant/Motor
 - Challenging Chemistry
- Thorough Technology Evaluation
 - Non Open Burning
 - Numerous Stakeholders
- Contained Burn Selected
- Construction Ongoing
 - Letterkenny, PA
 - RCRA and Air Permits Approved
 - DDESB
- Capacity
 - Up to 805 Pounds per Cycle
 - Up to 3 Cycles per Hour



China Lake, CA NSWC

Full Scale Demonstration (400lb/cycle)

- Cylindrical Steel Vessel (15' X 80')
- Sized For Gas Generation, Thermal Load, Peak Pressures
- Designed to Optimize Combustion Conditions
- Designed to Withstand Maximum Credible Event (MCE) in Case of Rocket Motor Deflagration
- Contains and Cools Gases After Firing
- Gases are Metered Through Pollution Control System



Large Tactical Motor Feed System

China Lake Feed System, Large Tactical Rocket Motors:

- Provides Convenient External Loading/Unloading
- Quick-Opening Autoclave Door Design
- Remote Automated Actuation with Ignition Interlock
- Designed for Flexibility to Accommodate a Wide Variety of Loads
- Minden Would Utilize a Cold Burn Tray Loaded by Forklift onto Firing “Shelf”



Pollution Control

- Designed For Chemistry of Workload
- Size/Expense Minimized by Proper Metering
- Stack Emissions Monitored



Particulate Samples
PAS INLET PAS OUTLET



Minden Contained Burn System

- Safety
- Proven
- Efficient Pollution Control
- Simple Controls
- Throughput
- Relatively Simple Permitting
- Versatile
- 880 lbs per Cycle
- 2-3 cycles per Hour
- 1800-2500 lbs per Hour

